



Collaborating in Cyberspace: A Case Study of Computer-Mediated Communication Among 100 Scholars in 15 Countries

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Abstract

The focus of this paper is the experience of an on-line research group, ProjectH.

ProjectH consisted of 100 experts from 15 countries who collaborated using computer-mediated communication, namely electronic mail or email. The anatomy of the process of collaborative computer-mediated communication is profiled and the benefits as well as its constraints in fostering the diffusion of knowledge and facilitating technological learning are identified. The role of asynchronicity as an inherent quality of electronic mail and its impact in bridging time and space divides among people, are also stressed and the potential benefits for the emerging globally dispersed, virtually connected, and knowledge-driven corporation are brought to the fore.

I. Introduction

For me, ProjectH is an example of a multi-year, broad-purpose, multi-person, international, collaborative effort--one in which the majority of the participants have never met face to face. ProjectH shows that important, productive research is possible (and possibly impossible otherwise!) by way of network collaboration.

ProjectH Member survey response, 1996.

Collaborative computer-mediated communication (CCMC) is conceptualized as the process of shared creation in which participants create a common meaning in a mutually shared space or environment, for a specific purpose, through the use of computer-mediated communication. The process of collaborative communication is probably one of the least understood and least appreciated forms of human interaction. The act of collaborative communication using computer-mediated communication has not been extensively studied (Schrage, 1990).

Research collaborations are an important social and organizational phenomenon. They are usually voluntary, and both their duration and their focus are determined by the participants. Collaborative kinds of work relationships may be becoming more important outside of academic settings as corporate restructuring minimizes vertical differentiation between employees and as the proportion of knowledge workers in the work place increases (Galegher, Kraut, & Egido, 1990).

Scientific collaboration provides a possible model of the way that professionals in many non-scientific fields construct intellectual products (Galegher, Kraut, & Egido, 1990). Most individuals collaborate in order to combine intellectual and material resources so as to accomplish a project of mutual interest. Collaboration enables scientists to tackle problems that they are incapable of working on alone because of limitations of resources, skills, and time (Galegher,

Kraut, & Egidio, 1990).

Collaborative communication may provide a way of managing several factors that otherwise inhibit communication within scientific communities: (1) extreme specialization in topic areas among the members of scientific communities, (2) complexity and overabundance of information, and (3) an exponential rate of change and a high level of uncertainty that exists in modern scientific research environments. Historically, some of the most important scientific discoveries and inventions were attained by means of collaborative communication (Schrage, 1990). Well known examples include the discovery of the structure of DNA by Francis Crick and James D. Watson (Watson, 1969), and the invention of personal computing at Xerox PARC in 1970-1975 by a team of about two dozen young computer scientists (Smith & Alexander, 1988).

Definition of Terms:

Collaboration is the act of collectively creating a shared mutual understanding for a specific purpose.

Communication is defined as a two-way process in which participants create and share information with one another in order to reach a mutual understanding (Rogers, 1986, pg. 199).

Collaborative communication is the process of shared creation of meaning in which participants create a mutual understanding in a mutually shared space or environment for a specific purpose. *Collaborative computer-mediated communication (CCMC)* is the process of shared creation in which participants create a common meaning in a mutually shared space or environment, for a specific purpose, through the use of computer-mediated communication (Allbritton, 1996).

II. ProjectH: A Collaborative Computer-Mediated Research Project

The ProjectH Research Group was formed on June 10, 1992. ProjectH is comprised of more than 100 scholars from 15 countries who collaborated by computer-mediated communication in order to study network-supported group activity in a computer-mediated environment. ProjectH was (1) a quantitative and qualitative study of the characteristics and contents of electronic mail, and (2) an example of collaborative research facilitated by electronic mail (see Tables 1 and 2).

This study describes the process of collaborative computer-mediated communication by (1) examining the emerging communication structure of ProjectH, (2) surveying members of ProjectH, and (3) analyzing archived discussions of ProjectH group members. The present study is guided by the following research questions:

Research Question #1: What was the emerging communication structure of ProjectH?

Research Question #2: What electronic message exchange formats and communication management strategies were used in the process of collaborative computer-mediated communication (CCMC) in ProjectH?

Research Question#3: What was the role of highly-active participants like coordinators, oracles, and coders in the process of CCMC in ProjectH?

Research Question #4: What is the role of the formal control of communication and the informal control of communication in the process of collaborative computer-mediated communication (CCMC)?

Research Question#5: What types of communication are utilized in the process of collaborative computer-mediated communication (CCMC)?

Table 1.

Project-H Time Line.

Date	Event
May 25, 1992	Comserv Hotline on the dynamics of group CMC-L.

May-June, 1992	Focus: Nature and longevity of news group threads.
June 1, 1992	ProjectH consists of 20 members.
June 3, 1992	Summary of ProjectH progress.
June 4, 1992	ProjectH consists of 40 members.
June 6, 1992	Poll of ProjectH members is posted.
June 10, 1992	Move to ProjectH, a Comserv sponsored hotline.
June 11, 1992	Posting of short biographies of ProjectH members.
January 15, 1993	Solicitation of new members on lists and news groups.
May - June, 1992	Research questions and hypothesis.
June 11, 1992	Beginning of ethical dilemma (300 messages).
June 11, 1992	Copyright and ownership dilemma.
June 13, 1992	Posting of poll responses.
June, 1992	Posting of credentials.
June -Aug., 1992	Words-L controversy.
July-Aug., 1992	Codebook creation.
January 15, 1993	Posting of draft copyright policy.
January 29, 1993	Posting of draft ethics policy.
December 1993	Coding.
July 11-15, 1994	ICA panel presentation.
October, 1993	Project completion.
1996	Network and Netplay: Virtual Groups on the Internet.

Communication technologies offer some advantages over traditional forms of communication. Advantages of e-mail and discussion lists, communication technologies utilized in ProjectH, are as follows: (1) communication technologies may not be location dependent, (2) communication technologies may not be time dependent, (3) communication technologies such as e-mail and discussion lists are an easier form of communication for users who lack sufficient oral skills in the English language, and (4) e-mail and discussion lists allow for greater response time than in face-to-face communication.

Electronic message exchange formats utilized by ProjectH members included (1) electronic discussion lists, (2) electronic mail, (3) file transfer protocol (FTP), (4) synchronous computer conferencing via Unix "Talk", (5) internet relay chat (IRC), and (6) telnet.

Table 2.

Countries Represented by ProjectH Members.

Country	Subscribers
Australia	6
Brazil	3
Canada	5
Germany	3
Great Britain	3
Hong Kong	1
Ireland	2
Israel	6
Mexico	1
Netherlands	2
Poland	1

Sweden	2
Switzerland	1
United States	70
Russia	1

Total 107

III. Research Design

The survey was designed to be administered via the World-Wide Web (WWW), and e-mail. Solicitations for participation in the survey were conducted mainly through the use of e-mail. Advantages of WWW technologies for survey methodology over traditional forms of survey creation, distribution, data-collection, and analysis include the following: (1) WWW survey enables point and click responses, (2) a WWW survey can be designed to provide structured responses to questions, (3) the electronic medium can be used for data-transfer and collation, (4) a WWW survey enables presentation of the questions for respondent re-inspection and review, (5) a WWW survey imposes very loose time constraints, and (6) adoptive questions can be designed to reduce the number and complexity of questions presented to the respondent. WWW surveys also allow for almost immediate receipt of responses, automatic data-entry, and continual data-analysis adjusting for new responses (Pitkow & Recker, 1994). The survey was distributed from February 20, 1996 to March 8, 1996 via the World Wide Web (WWW), using the forms function of WWW software browsers. The WWW survey findings regarding the emerging structure of Project H are tabulated in the Table 3 and the eras in which the project can be divided are presented in Table 4:

Table 3.

Survey Findings on the Emerging Communications Structure of ProjectH.

Research Question: What was the emerging communication structure of ProjectH?	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Members shared in the process of choosing research topics.	36%	32%	20%	4%	4%
ProjectH facilitated idea sharing.	64%	28%	0%	0%	4%
The lack of face to face communication inhibited collaborative project work.	0%	0%	8%	40%	48%
The fact that most participants never physically made members collaboration difficult.	4%	8%	8%	40%	36%
E-mail was an easier way of expressing opinions than speech.	16%	28%	20%	24%	8%

N=25

Table 4. Division of Eras in PrpjectH Discourse.

Era #1: Formation Era: May 25, 1992 - June 9, 1992 (113 messages)

1. E-mail message about group dynamics (Levine's Law) posted to Comserv discussion list (CMC-L);
2. Agreement to collaborate on research project (strawman proposal);
3. Forty members began to get to know one another;
4. Research goals began to be defined (what to study and how to study it);
5. Leadership (who will coordinate?)

Era #2: Ethics Era: June 10, 1992 - June 30, 1992 (161 messages)

1. Ethics of conducting the study;
2. "Flaming" issue;
3. Refrain by coordinators;
4. High volume of messages

Era #3 : Task Commencement Era: July 1, 1992 - January 31, 1993 (257 messages)

1. Formal summaries;
2. Pretest, coding, copyright, sampling;
3. Work activity;
4. Delineation of tasks;
5. Recruitment of members;
6. Membership tripled;
7. Readjustment of coordination strategies;
8. voting system, committees, draft proposal

Era 4: Task Completion Era: February 1, 1993 - October 29,1994 (550 messages)

1. Completion of coding and database;
2. Reflection on the ProjectH experience;
3. Closure;
4. Planning for future projects

IV. Conclusions

The present study looked at the process of collaborative computer-mediated communication, and the tools utilized by ProjectH members in order to accomplish goals in a collaborative manner. The unique properties of CMC along with the process of collaborative communication allow brilliant minds to work together to create collective knowledge products. As a tool for communication, the networked computer offers exciting possibilities for realizing the collaborative synergistic creation of knowledge and facilitating the process of technological learning (Carayannis &

Kassicieh, 1996).

The following are suggestions gleaned from the present study concerning how an invisible college of researchers might be created through the use of computer-mediated communication:

1. The role of the coordinators is crucial in that:

(1) coordinator(s) utilize electronic message exchange formats and communication management strategies in order to facilitate the collective creation of research meanings and goals, as well as the completion of tasks in order to reach the goals,

(2) more frequent communication by the coordinator(s) encourages more frequent communication by other participants, and

(3) coordinators facilitate the attainment of research goals, and coordinate the communication structure of the group.

2. Given that findings suggest a disproportionate number of highly-active participants, incentives should be enacted by the coordinators in order to increase the number of highly-active participants.

3. The space and time constraints of face-to-face, telephone, and FAX communication often make it difficult for researchers to communicate with one another. The survey and discourse analysis findings of the present research indicate that properties of CMC such as:

(1) storage and retrieval abilities,

(2) the text-based nature of the communication content,

(3) asynchronicity,

(4) transcendence of space, and

(5) the choice of degree of interactivity are supportive of connecting a group of scientific researchers in a cohesive manner.

The present findings also suggest that the unique properties of collaborative communication and CMC facilitate collaborative processes in a way that might not be possible in other environments such as face-to-face. The findings suggest that coordinators and members should refrain from considering the absence of physical presence and face-to-face communication as a detriment, but rather view the absence of these communication situations as having a neutral or positive effect.

4. Networked computers allow for the formation and maintenance of much larger invisible colleges than do conventional communication channels. Furthermore, the lack of contextual and nonverbal cues shifts the focus more towards communication content rather than communication context. This shift of focus facilitates, to some degree, interdisciplinary collaboration among potential members of a given invisible college.

5. Attention should be paid to:

(1) the level of previous experience and competence members have in using electronic message exchange formats, and

(2) the level of user complexity of the electronic message exchange formats used by members of the invisible college.

The application and significance of findings from the present study are presented as suggestions for the creation and maintenance of *invisible colleges* in a computer-mediated environment. Findings from the present research indicate that ProjectH was a collaborative endeavor and an invisible college. Crane (1972) defined an invisible college as *an informal interpersonal network that is based on shared scientific interests, rather than on geographic proximity*. Members of invisible colleges read the same literature, shared data, published as co-authors, met informally to discuss

work in progress, and occasionally became colleagues in the same organization (ibid). In the case of ProjectH, participants or members of the ProjectH invisible college collectively created the same literature, and shared a common "virtual" space, a computer network. Several ProjectH members co-authored papers for presentations, journal articles, and book chapters. Members of an invisible college often share a common paradigm (Kuhn, 1971). As an invisible college attracts more and more members, members begin to publish more and more interrelated work (Crane, 1972).

The most formidable knowledge product resulting from the ProjectH collaboration is a book entitled *Network and Netplay: Virtual Groups on the Internet*. This publication, presently in press, includes chapters which address the mutual influences between information technology and group formation and development in a computer-mediated environment. Some chapters draw on the database collectively created by ProjectH members, which contains more than 4,000 messages from dozens of discussion groups on the Internet, CompuServe, and Bitnet.

The present study points to two areas where further work and refinement are needed to leverage the unique properties of CCMC: the areas of electronic message exchange formats and communication management strategies. Effective communication management strategies might be refined and documented for use in other collaborative computer-mediated group projects. Communication management strategies could also be designed for the accomplishment of specific tasks.

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